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ABSTRACT

The influences of locus of control, awareness of control and metacognition on the use and transfer of a trained strategy were examined. Specifically, it was hypothesized that internal locus of control would be associated with more strategic performance, and that those children who were able to both accurately assess their performance with and without using the trained strategies and who realized that the effective strategy was responsible for their improved performance would be more likely to maintain and generalize the strategy. Two groups of third and fourth graders were trained to use two differentially effective strategies in a self-paced free-recall task. In addition, one of these groups received monitoring training designed to facilitate awareness of the effects of strategy usage. Results supported the hypothesis that children with knowledge and awareness of factors influencing success and failure will maintain use of a trained strategy. (Author/BW)

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Motivational and Metacognitive Aspects of Strategy Use and Transfer

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Motivational and Metacognitive Aspects
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The influence of locus of control, awareness of control and metacognition on the use and transfer of a trained strategy were examined. Two groups of third and fourth graders were trained to use two differentially effective strategies in a self-paced free-recall task. In addition, one of these groups received monitoring training designed to facilitate awareness of the effects of strategy usage. Results supported the hypothesis that children with knowledge and awareness of factors influencing success and failure will maintain use of a trained strategy.

Children routinely fail to maintain or generalize strategies they have been taught. In an attempt to explain this deficiency researchers have introduced the concept of metacognition (Cavanaugh & Borkowski, 1980; Pressley, Borkowski & O'Sullivan, 1983). Metacognition is knowledge and regulation of one's cognitive endeavors. Metacognitive processes are thought to affect maintenance and transfer of newly-trained strategies because they enable the learner to select, modify and invent strategies to meet special problems (Borkowski, Peck, Reid & Kurtz, 1983; Brown, 1978). Although knowledge about tasks and strategies is important in producing maintenance and generalization, also critical are motivational influences. It is proposed that children who believe they can influence the outcome in a cognitive endeavor will actively search for ways to do so, thus utilizing their metacognitive knowledge.

The present study investigated several motivational and metacognitive variables as mediators of strategy use and transfer. Two specific hypotheses were examined. First, differences in recall and strategy use between children with an internal versus an external locus of control were invesigated. Past research has suggested that children with an internal locus of control are more motivated to persist on challenging tasks, expend more effort and even have higher academic achievement than children with an external locus of control (Crandall, Katovsky & Petovitch, 1962; Chance, 1973; Feather, 1965). However, little research has examined how locus of control relates to the maintenance and generalization of a trained strategy.

Alternatively, Harter and Connell (in press) have suggested

that it is not whether children assume an internal or external locus of control that affects their performance, but rather whether or not they are aware of either type of factor influencing outcomes. The present study employed both a standardized measure (Crandall's Intellectual Achievement Responsibility Questionnaire) and specific academic causal attribuional questions to assess locus of control and awareness of control. An internal locus of control was expected to be associated with more strategic performance. However, the effects of the strategy plus monitoring training was expected to compensate for the proposed motivational deficit in externally controlled children.

The second hypothesis focused on the monitoring component of metacognition. It was expected that those children who were able to both accurately assess their performance with and without using the trained strategies and who realized that the effective strategy was responsible for their improved performance would be more likely to maintain and generalize the strategy. The monitoring component of the training was designed to facilitate self-evaluation and strategy attributions. It was predicted that more of the children who received both strategy and monitoring training would both accurately evaluate their performance and attribute it to the use of the strategy.

In addition to these two specific hypotheses, the relationship between metacognition, academic causal attributions, motivational orientation, locus of control and recall were examined with correlational analyses.

The self-paced free recall task employed by Butterfield, Siladi and Belmont (1980) was chosen as the training task for several reasons. First, based on extensive task analysis and research, Butterfield et al. have shown that children's use of an appropriate

strategy plus effort (i.e., study time) accounts for a significant proportion of the variance in memory performance. Due to the importance of both strategy and effort attributions in the present study, it was necessary to utilize a task where both these variables would significantly influence performance. Second, direct measures of strategy use are supplied by analysis of children's pause times while studying each item. For example, if a cumulative rehearsal strategy is being used, pause times increase systematically for the later items in the series. Third, several transfer tasks are available where the trained strategy can be applied effectively.

Method. Forty third and fourth grade children, ranging in age from 8.41 years to 10.58 years, from a suburban public school participated in the study. There were 12 children in both the strategy plus process monitoring condition and the process monitoring only condition, and 13 children in the strategy only condition. Three children only participated in the pre-test and moved out of the school area before strategy training. Twenty-four girls and 16 boys participated.

Locus of control and motivational orientation assessments were administered to children as groups in their regular classrooms. The IAR, which provided separate measures of internality for success and failure, was used to assess locus of control. Harter's Scale of Intrinsic and Extrinsic Motivation in the Classroom (1982) was used to assess motivational orientation. Based on Harter's research with the instrument, the curiosity, challenge and mastery subscales were combined to constitute a strictly motivational score, while the judgment and criteria subscales were combined to provide a motivational/informatonal score.

Statable metamemory, as assessed by adapted subtests of the Kruetzer, Leonard and Flavell battery (Kurtz & Borkowski, in press), and academic causal attributions were assessed individually during the second session. In order to determine children's academic causal attributions for their successes and failures in school, children were asked to rate the importance of six factors (ability, effort, task difficulty, help from others, luck and strategy use) in determining the outcomes of eight hypothetical situations (e.g., why they were able to remember all their spelling words on the weekly test).

For the third session, children were divided into three conditions. In the first condition, children received both strategy instructions and process monitoring instructions. Strategy instructions consisted of teaching the children two differentially effective memory strategies to remember series of seven letters each. The more effective strategy was a cumulative rehearsal fast finish, and the lesser effective was an individual item rehearsal strategy which actually hindered performance. Process monitoring instructions involved talking with the children about the importance of using strategies or 'special ways' to help them do their work better or easier and illustrating this principal with a simple, concrete task. Children in the second condition only received the strategy instruction component, while children in the third condition only received the process monitoring component and functioned as a control group. Following instructions, recall and strategy use were assessed on an uninstructed post-test, as well as series of numbers and words. In addition, following each recall attempt, children were asked to evaluate the accuracy of their performance and explain why they believed they had recalled as many of the items as they had.

Results and Conclusions. The first hypothesis, that children with an internal locus of control should recall more of the items and continue to use the generally more effective strategy on the recall tasks, was tested with a two-way, condition x locus, analysis of variance. A significant interaction between condition and locus (IAR for failure) was found for recall on the uninstructed post-test, $F(2,31)=4.27$, $p<.05$. Follow-up t-tests confirmed that children who only received strategy instructions and who assumed an internal control for failure recalled significantly more letters on the post-test than did children with an external control for failue, M=81% and M=52%, respectively. No significant difference in recall for children who received both strategy and process monitoring instructions was found. This finding supports the hypothesis that the strategy plus monitoring instructions was effective for improving the recall of children with an external locus of control.

Locus of control, as assessed by the IAR, failed to differentiate children with respect to the use of the effective strategy on the post-test and transfer tasks. Based on Harter and Connell's (1982) theory, post-hoc analyses were conducted to investigate differences in strategy use between children who were more or less aware of relevant causal factors as determined by the importance they placed on luck as a determining factor in academic outcomes. Results showed that on the uninstructed post-test, children who only received strategy instructions and who generally attributed success and failure to luck were marginally significantly less likely to continue using the effective strategy, $p<.06$, and also recalled fewer letters, $p<.05$. No differences were found for children who received both strategy and process monitoring instructions. The

hypothesis that it is awareness of relevant causal factors (whether internal or external) that influence strategy maintenance rather than locus of control is being explicitly tested in a second study (Weed, Ryan & Day, 1984).

Support for the hypothesis that children who both correctly evaluated their performance and who believed the effective strategy was responsible for their improved performance were more likely to continue using the strategy on the uninstructed post-test was found. Six out of the 25 children who were taught both strategies correctly monitored their performance with and without using the strategies and also attributed their performance to the use of the effective strategy. These six children continued to use the strategy on the post-test, $t(23)=2.48$, $p<.05$.

Results of the correlational analyses are displayed in Table 1. Due to the small number of subjects, correlations were performed on pre-test variables only. The significant correlation between task and strategy attributions collaborates findings from a separate study that children do not fully understand the concept of a strategy (Weed et al., 1984). The finding that strategy attributions correlate positively with task and luck attributions (uncontrollable) and negatively with metamemory, suggests that children view strategies differently than adults and in general do not view them positively. The lack of strategy generalization found in the present study may be partially explained by children's 'welding' the strategy to the training task (Brown, 1978) and considering it as part of the difficulty or ease of the task.

In conclusion, support was found for the hypothesis that children with knowledge and awareness of factors influencing success

and failure will maintain use of a trained strategy. However, as found in previous studies, only a few children continued to use the strategy when not explicitly made to do so, and few generalized the strategy to slightly different tasks. Children's limited conception of what a strategy is may partially account for this lack of continued strategy use.

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Table 1

Pearson's Correlations Between
Motivational and Metacognitive Measures

	A.A.	E.A.	L.A.	S.A.	T.A.	M.M.	I/S	I/F	Int/M	Int/I
Effort Attr.	.44**									
Luck Attr.	.37*	-.02								
Strategy Attr.	.43**	.30	.10							
Task Attr.	.30	.30	.43**	.50**						
Metamemory	-.12	-.15	-.33	-.40*	-.43*					
Internal for Success	.35*	.41*	-.08	.22	-.08	-.10				
Internal for Failure	-.05	.22	-.15	-.20	-.21	.15	.33			
Intrinsic/Mot.	.00	.51**	-.36*	.10	-.08	.06	.05	.42*		
Intrinsic/Info.	.14	.20	-.30	-.19	-.26	.42*	.10	.23	.30	
Recall	-.14	-.05	-.40*	.06	-.10	.27	.17	.06	.06	-.03

* $p < .05$

** $p < .01$